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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,366	12/22/2000	Reza-ur Rahman Khan	1875.0200000	8152

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EXAMINER	
PAREKH, NITIN	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 04/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/742,366	KHAN ET AL.	
	Examiner	Art Unit	
	Nitin Parekh	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 October 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *14,18-22,40,43-46,60 and 63-79* is/are pending in the application.

4a) Of the above claim(s) *40 and 43-46* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14,18-22,60 and 63-79* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 October 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *7,12,13* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Drawings

1. The formal drawings filed on 01/02/1998 are acceptable.

Information Disclosure Statement

2. The Information Disclosure Statements filed on 05-09-02 and 10-11-02 have been considered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 14, 18-20, 22, 60, 63-67, 70-74 and 77-79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III (US Pat. 5583377) in view of Higgins III (US Pat. 5291062).

Regarding claim 14, Higgins III discloses a ball grid (BGA) package comprising:

- a substrate including FR4/epoxy/organic, flexible/tape, etc. (12 in Fig. 1; Col. 3, line 45) having a first and second surface

- a heat sink/stiffener (22 in Fig. 1) composed of a base, sidewall and flange portions (24/26/28 in Fig. 1) having a first and second surface, where the second surface is attached to the first substrate surface
- an integrated circuit (IC) die being mounted on the first heat sink/stiffener surface (13 in Fig. 1)
- a plurality of solder balls (21 in Fig. 1) attached to the second substrate surface
- the substrate having a window opening (20 in Fig. 1) that exposes a portion of the second stiffener/heat sink surface, and
- the exposed portion of the second stiffener/heat sink surface is configured to be coupled to a substrate (34 in Fig. 1)

(Fig. 1; Col. 3 and 4).

Higgins, III teaches the heat sink/stiffener being configured such that it provides multiple functions including support for the IC; planarity of the top surfaces of the IC and the substrate (Col. 4, lines 15-60) and the composite heat sink/adhesive/substrate improving the rigidity and stiffening of the structure where the substrate can be an epoxy base substrate or the flexible/tape substrate (Col. 3, lines 42-52). Higgins, III teaches the dimensions of the heat sink/stiffener such as the flange width can be extended (Col. 6, lines 50-60) to the desired width beyond the opening in the substrate further improving the support, rigidity and stiffening for the structure.

Higgins, III, fails to specify coupling the heat sink/stiffener to a substrate which is a printed circuit board (PCB).

Higgins III ('062 patent) teaches using a mounting substrate such as a board/PCB for mounting external connections of a PGA (pin grid array) or a BGA package (Col. 4, line 25-30; Col. 5, line 55).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate coupling of the BGA to a PCB as taught by Higgins III ('062 patent) so that an external connection capability and interconnect density can be improved in Higgins, III's package.

Regarding claim 18, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claim 14 above, and Higgins, III further discloses the stiffener/heat sink having:

- a centrally located cavity/cavity-shaped portion that protrudes through the window opening (Fig. 1) wherein the surface of the cavity portion is a portion of the exposed portion of the second stiffener/heat sink surface
- the IC die being mounted in the cavity portion, and
- the surface of the cavity portion being bonded/plated with a solder/metal (36 in Fig. 1) that allows the stiffener/heat sink to be mounted to a soldering pad (35 in Fig. 1; Col. 4) on the substrate/PCB.

Regarding claim 19, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 14 and 18 above, including the surface of the cavity portion being plated with the solder.

Regarding claim 20, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claim 14 above, and Higgins, III further discloses the wire bonding/coupling of the IC die to the substrate and stiffener/heat sink being electrically coupled to a ground//first potential/voltage/plane to achieve the desired grounding/voltage connection in addition to the thermal dissipation (Col. 4, line 50; Col. 9, line 1-10).

Regarding claim 22, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claim 14 above, including the substrate being the tape substrate.

Regarding claim 60, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claim 14 above, including the substrate being the organic substrate.

Regarding claim 63, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 14 and 18 above, including the stiffener

having the cavity-shaped portion that protrudes through the window opening exposing the portion of the second surface of the stiffener.

Regarding claim 64, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 63 and 14 above, including the stiffener being coupled to the PCB.

Regarding claim 65, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 63, 14 and 20 above, including the stiffener being coupled to the first potential.

Regarding claim 66, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 63, 14 and 20 above, including the IC being mounted on the first surface of the stiffener.

Regarding claim 67, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 63, 14 and 18 above, including the IC being mounted to the first surface of the stiffener in the cavity-shaped portion of the stiffener.

Regarding claim 70, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 14 and 18 above, including the stiffener having the cavity-shaped portion that protrudes through the window opening exposing the portion of the second surface of the stiffener.

Regarding claim 71, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70 and 14 above, including the stiffener being coupled to the PCB.

Regarding claim 72, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70, 63, 14 and 20 above, including the stiffener being coupled to the first potential.

Regarding claim 73, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70 and 14 above, including the IC being mounted on the first surface of the stiffener.

Regarding claim 74, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70,14 and 18 above, including the IC being mounted to the first surface of the stiffener in the cavity-shaped portion of the stiffener.

Regarding claim 77, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 14 and 18 above, including the stiffener having the cavity-shaped portion that protrudes through the window opening exposing the portion of the second surface of the stiffener.

Regarding claim 78, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70, 14, 18 and 19 above, including the second surface of the stiffener being plated to facilitate the coupling/attachment to the PCB.

Regarding claim 79, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 70, 14, 18 and 19 above, including the second surface of the stiffener being plated with the solder.

5. Claims 21, 68, 69, 75 and 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III (US Pat. 5583377) and Higgins III (US Pat. 5291062) and further in view of Karnezos (US Pat. 6020637).

Regarding claim 21, Higgins, III and Higgins III ('062 patent) teach substantially the entire claimed structure as applied to claims 14 and 20 above, except coupling a ground pad of the IC die to the first surface of the stiffener using a wire bond.

Karnezos teaches using a coupling of an IC having a plurality of bonding wires and die pads including power and ground pads where a bonding wire corresponding to a ground ring connection on the first surface of the stiffener/heat sink is coupled to a respective die pad/ground pad (26"/21 in Fig. 2; Col. 2, line 30-40) while additional wire bonds (26' in Fig. 2) can be used to provide the desired signal/power connections for the corresponding die pads to the substrate.

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate coupling of the BGA to a PCB as taught by Higgins III ('062 patent) and coupling a ground/power pad of the IC die to the first surface of the stiffener using a wire bond as taught by Karnezos so that the power/ground routing and thermal dissipation can be improved in Higgins, III's package.

Regarding claim 68, Higgins, III, Higgins III ('062 patent) and Karnezos teach substantially the entire claimed structure as applied to claims 63, 66, 14 and 21 above, including a ground pad of the IC die being coupled to the first surface of the stiffener using a wire bond.

Regarding claim 69, Higgins, III, Higgins III ('062 patent) and Karnezos teach substantially the entire claimed structure as applied to claims 63, 66, 14 and 21 above, including a power signal pad of the IC die being coupled to the first surface of the stiffener using a wire bond.

Regarding claim 75, Higgins, III, Higgins III ('062 patent) and Karnezos teach substantially the entire claimed structure as applied to claims 63, 66, 14 and 21 above, including a ground pad of the IC die being coupled to the first surface of the stiffener using a wire bond.

Regarding claim 76, Higgins, III, Higgins III ('062 patent) and Karnezos teach substantially the entire claimed structure as applied to claims 63, 66, 14 and 21 above, including a power signal pad of the IC die being coupled to the first surface of the stiffener using a wire bond.

Response to Arguments

6. Applicant's arguments filed on 10-11-02 have been fully considered but they are not persuasive.

Applicant contends that Higgins III's heat sink is not a stiffener.

As explained above for claim 14, Higgins, III's heat sink is configured such that it provides multiple functions including support for the IC; providing a planarity of the top surfaces of the IC and the substrate and improving the rigidity, stiffening and reinforcing of the composite substrate/adhesive/heat sink structure. Therefore, Higgins III's heat sink/stiffener is applied for the claim rejections above.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 703-305-3410. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-3431.

Nitin Parekh

NP
04-07-03

Tom Thomas

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